DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ALGEBRA.

269. Proposed by C. N. SCHMALL, College of the City of New York.

Two ferry-boats started simultaneously from opposite sides of a river and one being faster than the other, they met 720 yards from the shore. Each boat remained 10 minutes in its slip to change passengers and started on its return trip, when it was found that they met again 400 yards from the other shore. What is the width of the river?

Solution by THEODORE L. De LAND, Treasury Department, Washington, D. C.

Let x=the width of the river in yards; y=the speed of the slower boat in yards per minute, and z=the speed of the faster boat in yards per minute.

Then $720 \div y$=the time for the slower boat to travel 720 yards, and $(x-720) \div z$=the time for the faster boat to travel $x-720$ yards; and as the two boats now meet, we equate the time, and have after reduction:

$$720z=(x-720)y \ldots (1).$$

Then $(x-720) \div y+10+400 \div y$=the time for the slower boat to reach the shore, wait ten minutes for passengers, and travel 400 yards; and $720 \div z+10+(x-400) \div z$=the time for the faster boat to reach the shore, wait ten minutes for passengers, and travel $x-400$ yards; and as the two boats now meet again, we equate the time as before, and have after reduction:

$$(x+320)y=(x-320)z \ldots (2).$$

Multiply (1) by (2), member by member, to eliminate y and z, and we have:

$$720(x+320)=(x-720)(x-320) \ldots (3).$$

From (3) we find $x=0$ or 1760 yards=1 mile, the width of the river.

From (1), after substituting for x, we have, $y : z :: 9 : 13$; or the speed of the slower boat is to the speed of the faster boat as 9 is to 13.

Also solved by L. E. Newcomb, Daniel B. Northrop, A. H. Holmes, J. E. Sanders, G. W. Greenwood, Frank M. Dyzer, and L. H. Rice.

270. Proposed by GEORGE H. HALLETT, Ph. D., Assistant Professor of Mathematics in The University of Pennsylvania, Philadelphia, Pa.

Find the simplest integral form of the sum $y(y-1) \ldots (y-x)+2y(2y-1) \ldots (2y-x)+\ldots+zy(zy-1) \ldots (zy-x)$.

No solution has been received.